INTERIM COMPACTION REPORT

PAALAA KAI UNITS I AND II

W.O. 773-20 FEBRUARY 15, 1980

FOR

OCEANIC PROPERTIES

GEOLABS-HAWAII

1553 COLBURN STREET, SUITE 202

HONOLULU, HAWAII 96817

GEOLABS-HAWAII
Geology, Soils and Foundation Engineering
1553 Colburn Street, Suite 202 • Honolulu, Hawaii 96817 • (808) 841-5064

February 15, 1980

W.O. 773-20

Oceanic Properties
130 Merchant Street
P.O. Box 2780
Honolulu, HI 96803

Attention: Mr. James Caldwell

Subject: Interim Compaction Report
Paalaa Kai Units I and II

Gentlemen:

This interim report summarizes our compaction and laboratory tests performed from about June, 1979, to the present during the earthwork and grading operation at the above referenced project.

The lots in Units I and II have basically been constructed to final grade and compacted adequately. The compaction test results for the in-place fill are presented in the attached compaction test summary.

Prior to fill placement, the existing vegetation was removed and the existing ground scarified and recompacted. The fill was then placed in horizontal lifts and compacted to a minimum of 90 percent of its maximum dry density.

During the grading period, various on-site soil types were tested prior to be used in the fill. The maximum soil densities and optimum moisture contents were established in our laboratory in accordance with ASTM D-1557 designation, and the test results are as follows:

Soil Type	Maximum Density (p.c.f.)	Optimum Moisture (%)
Tannish brown silty sand with coral fragments	102.5	17.0
Reddish brown silty clay	100.5	26.0
Brown silty clay	99.0	28.5
Dark brown silty clay	91.9	30.5

Peat Bog Area

The original soil investigation encountered soft, organic silt and peat in the lowlying gully area at the northern boundary of the project. Fill, up to about 12 feet high, was planned at the edge of this peat bog area.

It was originally assumed that the soft-wet upper soils would be limited in extent and that it would be possible to eliminate settlements by excavations and construction of suitable granular buttress.

Additional borings and test pits (refer to our letter report of June 29, 1979) disclosed the presence of a stiff upper crust of clayey silt, about seven (7) feet thick, over four (4) to twelve (12) feet of soft soils.

Analysis based on these additional field exploration and laboratory tests indicated that the calculated factor of safety against slope failure or squeezing was on the order of two (2); therefore, the granular buttress and key was not required.

Settlement gauges were installed prior to filling in this area in order to monitor the settlement rates caused by the new fill over the soft subsoils. Based on the settlement gauge readings transmitted to our office by the project surveyor, it appears that the settlement rates have reduced to tolerable levels for the proposed post-and-beam residential houses planned for this project.

Grading was not planned over the remaining makai portion of the lowlying area located below the 3:1 (H:V) fill slope around Lot Nos. 204 to 207, 210 to 215 and 219 to 220. However, due to the excess material generated during the site grading operations, this area was used as a disposal site for

the excess boulders and soil. About six (6) feet of fill was planned. A previous boring drilled in this area indicated an 8-foot crust underlain by 15 feet of soft organic silt and peat. Long-term settlements are anticipated due to the weight of this fill; however, structures are not planned in this area.

RECOMMENDATIONS

Foundations

Unit I

Post-and-beam construction supported on short, drilled pier foundations were used for the development. Most of the soils encountered in Unit I of the development exhibited low expansion potential. Minimum footing embedments of 12 inches were used for these lots. Lot-by-lot analysis, utilizing laboratory ring swell tests, disclosed that the subgrade soils at 20 lots (Lots 7 to 15, 29, 30, 32, 18 to 20, and 77 to 80) exhibited moderate swell potential. Deeper footing embedments of 24 inches were used for these pier footings to reduce the shrink swell effects of these soils.

Unit II

The field exploration disclosed the presence of moderately expansive soil in the mauka (northern) portion of Unit II. Lot-by-lot soil analysis utilizing laboratory ring swell tests at the project site were performed during and after the grading operations to evaluate the expansion potential of the subgrade soils. The results of the laboratory ring swell tests are presented again in the appendix.

Based on the results of the laboratory ring swell tests, the recommended embedment depths for the post footings were developed. These embedment depths were required to reduce the shrink-swell effects of the expansive soils. It had been determined that drilled-in-place short pier foundations will be used for this project.

The following sizes and embedment depths of the pier foundations are recommended:

Type I Footing (low expansion potential at Lots 151 to 165, 221, 236 to 240 and 270 to 278) - 12-inch minimum depth

Type II Footing (moderate to high expansion potential - remaining Phase II lots) - 36-inch minimum depth

All post footings should be set-backed a minimum of five (5) feet away from the top of cut and fill slopes.

Runoff water should be diverted away by swales around all footings.

Site Regrading

Subsequent to completion of lot grading, utility trenches within the lot pad should be properly backfilled and compacted under the observations of a soils technician.

This office assumes no responsibility for any alterations made to slopes or pads on the subject lots subsequent to the issuance of this report without our knowledge and written approval.

Future Construction

The home owners should be made aware of the expansive soil condition existing at the site and the required foundation embedments. Future additions and improvements should be done under the guidance of a licensed engineer.

Should you have any questions concerning the above results and recommendations, please feel free to call this office.

The following appendices are attached and complete this report:

Appendix A - Results of Lot-by-Lot Soil Analysis - Unit I, Geolabs-Hawaii Letter Dated September 28, 1979

Results of Lot-by-Lot Soil Analysis - Unit II, Geolabs-Hawaii Letter Dated January 23, 1980

Appendix B - Summary of Density Tests

Respectfully submitted,

C.W. ASSOCIATES, INC.
dba GEOLABS-HAWAII

by Bob Y.K. Wong
Bob Y.K. Wong, P.E.

BYKW:CSM:sf

(6 copies submitted)

APPENDIX A

RESULTS OF LOT-BY-LOT SOIL ANALYSIS

UNITS I AND II

GEOLABS-HAWAII
Geology, Soils and Foundation Engineering
1553 Colburn Street, Suite 202 • Honolulu, Hawaii 96817 • (808) 841-5064

September 28, 1979

W.O. 773-20

EDW Architects & Planning Consultants
828 Fort Street, Suite 200
Honolulu, Hawaii 96813

Attention: Mr. Lew Ingleson

Subject: Results of Lot-By-Lot Soil Analysis
Paalaa Kai Subdivision, Unit 1
Waialua, Oahu, Hawaii

Gentlemen:

Based on our previous meeting (July 16, 1979) at your office, it was accepted by the building contractor, the soil and the structural engineer that it was more economical and feasible to drill in-place 18-inch diameter short pier a minimum depth of 12 inches below the finish grade for soil type 1 footing design in Unit 1 of the subject subdivision.

Based on additional laboratory swell test results and lot-by-lot analysis at the above referenced Unit 1 subdivision, moderately to highly expansive soil conditions are encountered which would require deepening the drilled pier or caisson down to a minimum depth of 24 inches below finish outside grade. The lots which will require 24-inch deep footing piers are as follows:

Lots 7 to 15 (9 lots)
Lots 18 to 20 (3 lots)
Lots 29 to 32 (4 lots)
Lots 77 to 80 (4 lots)

Total: 20 lots

The remaining lots in Unit 1 have low expansive soil condition, and therefore the drill in-place short pier can be designed for original Type 1 footing condition, e.g. 12-inch minimum depth by 18-inch diameter with 12" x 12" x 7" precast pier.

Should you have any questions concerning the above results and recommendations, please feel free to call this office.

Respectfully submitted,

C.W. ASSOCIATES, INC.
dba GEOLABS-HAWAII

By Bob Y.K. Wong
Bob Y.K. Wong, P.E.

BYKW:cw

XC: Oceanic Properties (Attn: Mr. J.G. Caldwell)
Mililani Town Inc. (Attn: Mr. John Murchison)
Shigemura & Yamamoto (Attn: Mr. Howard Lau)

Enclosure: Summary of Lab Ring Swell Tests

Should you have any questions concerning the above results and recommendations, please feel free to call this office.

Respectfully submitted,

C.W. ASSOCIATES, INC.
dba GEOLABS-HAWAII

By Bob Y.K. Wong
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Enclosure: Summary of Lab Ring Swell Tests

W.O. 773-20
September 28, 1979

SUMMARY OF LAB RING SWELL TESTS

Paalaikai Subdivision Unit I

Lot Nos.	Description	Moisture Content Initial	Final	Swell (%)
1-3	Brown Clayey Silt	20.6	36.0	5.3
4-6	Brown Clayey Silt	20.4	38.5	4.4
7-9	Brown Clayey Silt	20.8	-	6.9
10-12	Brown Clayey Silt	22.0	40.4	5.1
13-15	Brown Clayey Silt	22.0	39.9	7.0
16-17	Dark Brown Clayey Silt	22.0	24.6	3.7
18-20	Dark Brown Clayey Silt	21.4	-	4.8
21-23	Light Brown Clayey Silt	27.1	34.9	1.2
24	Dark Reddish Brown Clayey Silt	20.5	40.7	2.1
24-26	Dark Brown Clayey Silt	22.2	38.8	3.8
27-29	Dark Brown Clayey Silt	24.5	38.0	3.7
30-31	Reddish Brown Clayey Silt	24.5	35.8	3.3
30-32	Dark Brown Clayey Silt	23.2	41.6	7.9
33	Reddish Brown Clayey Silt	29.6	32.0	3.4
35	Reddish Brown Clayey Silt	28.6	32.2	2.8
43-48	Reddish Brown Clayey Silt	23.0	36.6	3.9
49-52	Reddish Brown Clayey Silt	24.0	35.2	1.6
57-58	Reddish Brown Clayey Silt	23.0	36.5	3.3
59-62	Reddish Brown Silty Clay	27.2	34.9	5.0
59-62	Dark Brown Clayey Silt	23.5	39.4	3.8

SUMMARY OF LAB RING SWELL TESTS (CONT.)

Lot Nos.	Description	Moisture Content Initial	Final	Swell (%)
63-65	Reddish Brown Clayey Silt	24.5	33.2	2.7
63-65	Light Brown Clayey Silt	23.0	39.3	4.1
66-68	Reddish Brown Clayey Silt	31.2	36.6	0.2
69-72	Reddish Brown Clayey Silt	27.0	34.4	1.2
73-76	Reddish Brown Clayey Silt	28.9	34.1	1.0
77-80	Reddish Brown Silty Clay	24.2	31.6	5.1
81-83	Light Brown Clayey Silt	22.7	34.1	2.9
84-86	Reddish Brown Clayey Silt	27.6	30.3	0.5

GEOLABS-HAWAII
Geology, Soils and Foundation Engineering
1553 Colburn Street, Suite 202 • Honolulu, Hawaii 96817 • (808) 841-5064

January 23, 1980

W.O. 773-20

EDW Architects & Planning Consultants
Suite 200, 828 Fort Street
Honolulu, HI 96813

Attention: Mr. Lew Ingleson

Subject: Results of Lot-by Lot Soil Analysis
Paalaa Kai Subdivision, Unit II
Waialua, Oahu, Hawaii

Gentlemen:

Based on additional laboratory swell test results and lot-by-lot analysis at the above referenced Unit II Subdivision, low, moderately and highly expansive soil conditions were encountered.

For low expansive soil, drill in-place short piers can be designed. Type I footing foundation for drilled in-place pier should have 12-inch minimum depth and 18-inch diameter auger hole with 12" x 12" x 7" precast pier. The following lots can use the above Type I footing foundation:

Lot 151-165	(15 lots)
Lot 221	(1 lot)
Lot 236-240	(5 lots)
Lot 270-278	(9 lots)
TOTAL	30 lots

The remaining 177 lots in Unit II have moderately to highly expansive soil conditions. Therefore, it would require Type II drilled in-place pier foundation which should extend a minimum of 36-inch down.

All loose material at the bottom of the auger drilled hole should be removed and cleaned prior to pour concrete.

Should you have any questions concerning the above results and recommendations, please feel free to call this office.

Respectfully submitted,

C.W. ASSOCIATES, INC.
dba GEOLABS-HAWAII

by Bob Y.K. Wong
Bob Y.K. Wong, P.E.

BYKW:DL:sf

XC: Oceanic Properties
Attn: Mr. J.G. Caldwell

Mililani Town Inc.
Attn: Mr. John Murchison

Shigemura, Yamamoto & Associates
Attn: Mr. Howard Lau

Enclosure: Summary of Laboratory Ring Swell Tests

SUMMARY OF LABORATORY RING SWELL TESTS

Paalaa Kai Subdivision, Unit II

Lot Nos.	Description	Initial Moisture	Final Moisture	Swell (%)
104-110	Brown silty clay	21.9	41.1	4.1
111-122	Brown silty clay	25.1	38.7	3.4
123-127	Dark brown silty clay	19.2	45.2	9.0
128-135	Dark brown silty clay	22.7	45.1	7.4
136-139	Brown clayey silt	23.0	51.0	4.1
140-144	Light brown clayey silt	19.0	47.0	3.9
145-147	Dark reddish brown clayey silt	24.8	37.6	5.8
148-150	Dark reddish brown silty clay	19.0	51.3	7.6
151-157	Tannish brown clayey silt with coral fragments	28.0	54.0	0.7
158-160	Tannish brown clayey silt with coral fragments	13.0	25.9	1.0
161-164	Light brown clayey silt	20.0	30.0	2.5
165-169	Brown clayey silt	11.0	25.0	3.0
170-171	Brown silty clay	23.0	52.0	5.1
172-173	Brown silty clay	22.0	43.0	6.6
174-176	Brown silty clay	22.6	40.0	7.3
177-179	Brown silty clay	21.5	39.0	6.9
180-182	Brown silty clay	22.0	38.0	5.7
183-185	Brown clayey silt	22.0	38.0	2.8
186-188	Brown clayey silt	17.4	47.6	3.9
189-202	Brown clayey silt	27.0	38.4	3.7

Lot Nos.	Description	Initial Moisture	Final Moisture	Swell (%)
203-208	Brown silty clay	24.9	39.2	5.5
209-213	Brown silty clay	26.0	-	7.6
214-218	Dark brown clay	26.7	38.6	19.2
219-221	Dark brown clay	16.2	44.5	21.5
222	Tannish brown sandy silt with clay	18.0	24.0	0.0
223-235	Dark brown clay	17.3	42.7	16.8
236-240	Tannish brown sandy silt with clay	17.0	22.0	0.7
241-244	Dark brown clay	18.9	43.2	12.4
245-251	Dark brown clay	23.3	44.7	18.5
252-269	Dark brown clay	28.1	37.8	4.5
270-271	Reddish brown clayey silt	22.0	32.4	2.4
272-273	Reddish brown clayey silt	28.0	35.5	0.0
274-275	Brown silty clay	23.0	38.0	2.9
276-278	Brown silty clay	27.0	31.0	2.5
279-281	Brown silty clay	26.1	-	5.0
282-284	Dark brown clay	21.2	39.6	11.2
285-286	Brown silty clay	23.3	38.7	5.0
287-291	Dark brown clay	24.0	49.6	9.0
292-293	Dark brown clay	17.5	30.4	8.9
294-298	Dark brown clay	20.1	38.7	12.1
299-304	Dark brown clay	25.0	35.3	12.2
305-310	Dark brown clay	19.0	34.0	9.0

APPENDIX B

SUMMARY OF DENSITY TESTS

SUMMARY OF DENSITY TESTS
CONTROL OF COMPACTED FILL

W.O. NO. 773-20
PAGE 1 OF 12

OWNER Oceanic Properties
JOB Paalaa Kai I & II

TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
1	6-25	Lot 113	20.0	90.0	102.5	15.6	98.5	96.1	Pass
2	"	109	16.0	"	"	16.6	96.7	94.3	"
3	"	106	14.0	"	"	17.4	95.8	93.5	"
4	"	113	21.0	"	"	16.4	92.9	90.6	"
5	"	109	17.0	"	"	15.9	96.7	94.3	"
6	"	109	15.0	"	"	16.9	93.8	91.5	"
7	6-26	113	22.0	"	"	16.5	99.3	96.9	"
8	"	109	18.0	"	"	15.6	93.7	91.4	"
9	"	106	16.0	"	"	16.7	96.7	94.3	"
10	"	106	17.0	"	"	16.3	99.4	97.0	"
11	"	251	16.0	"	"	15.4	99.0	96.6	"
12	6-27	106	18.0	"	"	15.8	97.5	95.2	"
13	"	109	19.0	"	"	17.6	95.7	93.4	"
14	"	113	23.0	"	"	16.2	98.2	95.8	"
15	"	251	17.0	"	"	14.7	95.9	93.6	"
16	"	251	F.G.	"	"	14.8	95.4	93.1	"
17	"	16	34.0	"	"	16.1	94.6	92.3	"
18	"	21	32.0	"	"	16.3	93.7	91.4	"
19	"	26	30.0	"	"	15.1	94.4	92.1	"
20	6-28	16	35.0	"	"	15.6	94.0	91.7	"
21	"	21	33.0	"	"	15.8	93.8	91.5	"
22	"	26	31.0	"	"	15.3	98.3	95.9	"
23	"	16	36.0	"	91.9	32.9	90.3	98.2	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL				W.O. NO. 773-20 PAGE 2 OF 12		OWNER Oceanic Properties JOB Paalaa Kai I & II			
TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
24	6-28	Lot 21	34.0	90.0	91.9	29.6	86.8	94.4	Pass
25	"	26	32.0	"	"	31.6	87.0	94.7	"
26	6-29	30	32.0	"	99.0	26.1	94.1	95.1	"
27	"	35	37.0	"	"	27.5	91.8	92.7	"
28	"	40	42.0	"	"	28.0	94.4	95.4	"
29	"	30	33.0	"	"	26.9	92.7	93.6	"
30	"	35	38.0	"	"	25.5	93.6	94.5	"
31	"	40	43.0	"	"	24.7	93.8	94.7	"
32	7-2	16	36.0	"	"	27.5	92.5	93.4	"
33	"	26	33.0	"	"	26.2	93.2	94.1	"
34	"	100	45.0	"	"	28.3	91.4	92.3	"
35	"	103	46.0	"	"	30.4	91.5	92.4	"
36	7-3	64	42.0	"	91.9	29.8	86.2	93.8	"
37	"	61	45.0	"	"	30.0	85.3	92.8	"
38	"	14	36.0	"	"	32.1	82.9	90.2	"
39	"	8	43.0	"	102.5	16.4	92.5	90.2	"
40	7-5	14	37.0	"	100.5	28.3	91.3	90.8	"
41	"	64	43.0	"	"	27.1	91.7	91.2	"
42	"	61	46.0	"	"	29.9	91.1	90.6	"
43	"	64	44.0	"	"	30.6	92.0	91.5	"
44	"	61	47.0	"	"	27.4	92.2	91.7	"
45	7-6	1	51.2	"	"	30.5	91.3	90.8	"
46	"	1	52.0	"	"	30.4	91.6	91.1	"

SUMMARY OF DENSITY TESTS
CONTROL OF COMPACTED FILL

W.O. NO. 773-20
PAGE 3 OF 12

OWNER Oceanic Properties
JOB Paalaa Kai Unit I & II

TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
47	7-6	Lot 30	34.0	90.0	100.5	27.2	93.0	92.5	Pass
48	"	35	39.0	"	"	27.9	93.6	93.1	"
49	7-9	26	33.0	"	"	28.8	93.7	93.2	"
50	"	21	34.0	"	"	25.8	95.5	95.0	"
51	"	16	37.0	"	"	26.2	94.5	94.0	"
52	"	100	46.0	"	"	26.5	94.6	94.1	"
53	"	103	47.0	"	"	27.3	95.0	94.5	"
54	"	40	44.0	"	"	30.7	92.3	91.8	"
55	7-10	78	44.0	"	"	28.8	92.0	91.5	"
56	"	80	40.0	"	"	27.1	93.5	92.0	"
57	"	47	47.0	"	"	27.9	93.7	93.2	"
58	"	47	48.0	"	"	29.8	93.1	92.6	"
59	"	47	49.0	"	"	32.1	92.2	91.7	"
60	"	204	17.0	"	99.0	25.9	94.0	94.9	"
61	"	207	17.0	"	"	26.3	92.3	93.2	"
62	7-11	204	18.0	"	"	25.4	94.1	95.1	"
63	"	207	18.0	"	"	27.0	93.5	94.4	"
64	"	204	19.0	"	"	28.6	91.6	92.5	"
65	"	207	19.0	"	"	27.1	93.3	94.2	"
66	"	292	28.0	"	"	33.2	90.2	91.1	"
67	"	292	29.0	"	"	28.2	91.1	92.0	"
68	7-12	292	30.0	"	"	26.0	94.3	95.3	"
69	"	295	37.0	"	"	29.6	92.3	93.2	"

SUMMARY OF DENSITY TESTS
CONTROL OF COMPACTED FILL

W.O. NO. 773-20
PAGE 4 OF 12

OWNER Oceanic Properties
JOB Paalaa Kai Unit I & II

TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
70	7-12	Lot 299	39.0	90.0	99.0	28.4	91.4	92.4	Pass
71	"	303	41.0	"	"	30.7	91.3	92.2	"
72	"	307	43.0	"	"	27.2	93.7	94.6	"
73	"	204	20.0	"	"	30.3	91.3	92.2	"
74	"	207	20.0	"	"	27.6	92.9	93.8	"
75	7-13	292	31.0	"	"	27.1	93.3	94.2	"
76	"	292	32.0	"	"	27.7	93.6	94.5	"
77	"	295	38.0	"	"	28.8	92.2	93.1	"
78	"	299	40.0	"	"	30.0	91.8	92.7	"
79	"	303	42.0	"	"	27.8	92.0	92.9	"
80	"	307	44.0	"	"	28.6	92.2	93.1	"
81	"	292	33.0	"	"	28.1	91.6	92.5	"
82	"	100	47.0	"	100.5	30.6	91.3	90.8	"
83	"	103	48.0	"	"	28.1	92.9	92.4	"
84	"	1	53.0	"	"	26.8	91.8	91.3	"
85	7-16	292	33.0	"	99.0	27.4	93.9	94.8	"
86	"	292	34.0	"	"	26.6	92.9	93.8	"
87	"	292	35.0	"	"	26.9	93.3	94.2	"
88	"	295	39.0	"	"	26.0	93.7	94.6	"
89	"	299	41.0	"	"	28.0	92.5	93.4	"
90	"	299	42.0	"	"	25.9	94.0	94.9	"
91	"	303	43.0	"	"	29.5	93.0	93.9	"
92	"	307	45.0	"	"	27.6	92.5	93.4	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL			W.O. NO. 773-20			OWNER Oceanic Properties			
			PAGE 5 OF 12			JOB Paalaa Kai Unit I & II			
TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
93	7-16	Lot 162	43.0	90.0	99.0	26.2	93.3	94.2	Pass
94	"	162	44.0	"	"	26.7	92.3	93.2	"
95	"	169	42.0	"	"	26.5	92.7	93.6	"
96	"	169	43.0	"	"	25.9	91.7	92.6	"
97	"	175	44.0	"	"	27.7	92.1	93.0	"
98	"	175	45.0	"	"	28.3	92.0	92.9	"
99	7-17	1	54.0	"	"	27.9	91.6	92.5	"
100	"	1	55.0	"	"	27.9	91.7	92.6	"
101	"	8	44.0	"	"	27.3	93.2	94.1	"
102	"	14	38.0	"	"	24.9	94.2	95.2	"
103	"	303	44.0	"	"	29.1	91.2	92.1	"
104	"	307	46.0	"	"	26.3	94.3	95.3	"
105	"	162	45.0	"	"	24.8	95.9	96.9	"
106	"	167	44.0	"	"	26.6	93.7	94.6	"
107	"	175	46.0	"	"	25.5	94.1	95.1	"
108	"	177	41.0	"	"	26.9	92.8	93.7	"
109	7-17	186	44.0	"	"	25.8	93.3	94.2	"
110	"	188	44.0	"	"	25.6	94.4	95.4	"
111	7-18	61	48.0	"	100.5	27.6	92.1	91.6	"
112	"	78	45.0	"	"	26.9	93.3	92.8	"
113	"	78	46.0	"	"	27.4	92.3	91.8	"
114	"	80	41.0	"	"	25.4	93.9	93.4	"
115	"	47	50.0	"	"	29.3	91.3	90.8	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL				W.O. NO. 773-20 PAGE 6 OF 12		OWNER Oceanic Properties JOB Paalaa Kai I & II			
TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
116	7-18	Lot 162	46.0	90.0	99.0	27.2	92.5	93.4	Pass
117	"	169	45.0	"	"	26.8	93.6	94.5	"
118	"	175	47.0	"	"	27.9	92.0	92.9	"
119	"	177	42.0	"	"	28.7	90.4	91.3	"
120	"	186	45.0	"	"	26.8	92.4	93.3	"
121	7-19	1	F.G.	"	100.5	27.5	91.8	91.3	"
122	"	8	F.G.	"	"	25.6	93.1	92.6	"
123	"	14	F.G.	"	"	28.1	92.1	91.6	"
124	"	61	49.0	"	"	29.8	91.3	91.7	"
125	"	64	45.0	"	"	25.7	93.8	93.3	"
126	"	16	38.0	"	"	24.4	94.2	93.7	"
127	"	26	34.0	"	99.0	27.2	92.0	91.5	"
128	"	292	36.0	"	"	27.4	91.4	92.3	"
129	"	295	40.0	"	"	25.1	92.7	93.6	"
130	"	299	43.0	"	"	26.1	92.2	93.1	"
131	7-20	61	F.G.	"	100.5	25.2	94.2	93.7	"
132	"	64	F.G.	"	"	26.1	93.3	92.8	"
133	"	47	51.0	"	"	25.5	92.7	92.2	"
134	"	47	52.0	"	"	26.8	92.5	90.0	"
135	"	169	46.0	"	99.0	27.1	91.7	92.6	"
136	"	177	43.0	"	"	27.7	91.1	92.0	"
137	"	186	46.0	"	"	26.9	91.6	92.5	"
138	"	188	45.0	"	"	26.0	93.3	94.2	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL				W.O. NO. 773-20		OWNER Oceanic Properties			
				PAGE 7 OF 12		JOB Paalaa Kai Units I & II			
TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
139	7-20	Lot 191	41.0	90.0	99.0	25.8	94.0	94.9	Pass
140	"	194	38.0	"	"	26.4	93.0	93.9	"
141	"	198	34.0	"	"	27.3	91.9	92.8	"
142	"	254	32.0	"	"	27.4	91.8	92.7	"
143	"	257	35.0	"	"	26.4	93.6	94.5	"
144	"	261	37.0	"	"	25.9	93.2	94.2	"
145	7-23	16	F.G.	"	100.5	26.7	92.7	92.2	"
146	"	21	F.G.	"	"	24.5	93.7	93.2	"
147	"	26	F.G.	"	"	24.8	93.7	93.2	"
148	"	303	45.0	"	99.0	27.2	92.4	93.3	"
149	"	307	47.0	"	"	28.3	92.4	93.3	"
150	"	169	47.0	"	"	24.7	94.7	95.7	"
151	"	121	26.0	"	"	28.4	91.8	92.7	"
152	"	136	34.0	"	"	26.7	93.1	94.0	"
153	"	140	38.0	"	"	25.8	94.5	95.5	"
154	"	146	45.0	"	"	27.8	92.4	93.3	"
155	7-24	100	48.0	"	100.5	25.6	93.7	93.2	"
156	"	100	F.G.	"	"	27.3	92.1	91.6	"
157	"	103	49.0	"	"	26.9	92.0	91.5	"
158	"	103	F.G.	"	"	29.0	91.1	90.6	"
159	"	78	47.0	"	"	27.3	92.5	92.0	"
160	"	80	42.0	"	"	28.3	92.6	92.1	"
161	7-25	47	53.0	"	"	25.3	94.2	93.7	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL				W.O. NO. 773-20 PAGE 8 OF 12		OWNER Oceanic Properties JOB Paalaa Kai Units I & II			
TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
162	7-25	Lot 121	27.0	90.0	99.0	26.8	93.2	94.1	Pass
163	"	121	28.0	"	"	26.4	94.6	95.6	"
164	"	136	35.0	"	"	26.1	92.6	93.5	"
165	"	136	36.0	"	"	25.2	95.7	96.7	"
166	"	140	39.0	"	"	26.9	93.1	94.0	"
167	"	146	46.0	"	"	27.8	92.4	93.3	"
168	"	146	47.0	"	"	27.1	92.3	93.2	"
169	7-26	30	F.G.	"	100.5	25.8	92.8	92.3	"
170	"	35	F.G.	"	"	25.0	94.2	93.7	"
171	"	40	F.G.	"	"	27.7	91.8	91.3	"
172	"	78	F.G.	"	"	25.6	93.4	92.9	"
173	"	80	F.G.	"	"	24.7	95.4	94.9	"
174	"	47	F.G.	"	"	25.5	33.7	93.2	"
175	7-27	292	37.0	"	99.0	25.5	93.5	94.4	"
176	"	299	44.0	"	"	25.0	93.6	94.5	"
177	"	188	46.0	"	"	25.7	92.9	93.8	"
178	"	191	42.0	"	"	26.6	92.9	93.8	"
179	"	194	39.0	"	"	27.1	92.2	93.1	"
180	"	198	35.0	"	"	27.0	93.3	94.2	"
181	7-30	254	33.0	"	"	24.5	94.2	95.2	"
182	"	257	36.0	"	"	24.4	93.9	94.8	"
183	"	261	38.0	"	"	25.4	94.7	95.7	"
184	"	121	29.0	"	"	26.8	92.4	93.3	"

SUMMARY OF DENSITY TESTS CONTROL OF COMPACTED FILL			W.O. NO. 773-20			OWNER Oceanic Properties			
			PAGE 9 OF 12			JOB Paalaa Kai Units I & II			
TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
185	7-30	Lot 136	37.0	90.0	99.0	26.3	93.1	94.0	Pass
186	"	146	48.0	"	"	26.7	93.4	94.3	"
187	"	146	49.0	"	"	26.3	93.8	94.7	"
188	7-31	212	18.0	"	99.0	27.1	92.3	93.2	"
189	"	254	34.0	"	"	29.3	92.2	93.1	"
190	"	257	37.0	"	"	25.6	93.8	94.7	"
191	"	261	39.0	"	"	27.9	93.9	94.8	"
192	"	212	19.0	"	"	29.4	93.0	93.9	"
193	"	215	19.0	"	"	29.2	91.7	92.6	"
194	"	212	20.0	"	"	28.3	92.2	93.1	"
195	8-1	215	19.0	"	"	26.9	93.4	94.3	"
196	"	133	33.0	"	"	28.5	91.4	92.3	"
197	"	215	20.0	"	"	25.8	94.0	94.9	"
198	"	292	38.0	"	"	28.3	92.1	93.0	"
199	"	204	21.0	"	"	27.4	92.2	93.1	"
200	"	207	21.0	"	"	26.3	92.6	93.5	"
201	"	215	21.0	"	"	25.3	92.9	93.8	"
202	8-2	204	22.0	"	100.5	31.9	90.4	90.0	"
203	"	191	43.0	"	99.0	30.5	90.7	91.6	"
204	"	194	40.0	"	"	29.1	92.5	93.4	"
205	"	198	36.0	"	"	27.2	94.6	95.6	"
206	"	215	22.0	"	"	27.4	91.7	92.6	"
207	"	215	23.0	"	"	25.3	94.6	95.6	"

SUMMARY OF DENSITY TESTS
CONTROL OF COMPACTED FILL

W.O. NO. 773-20
PAGE 10 OF 12

OWNER Oceanic Properties
JOB Paalaa Kai Units I & II

TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
208	8-3	Lot 204	23.0	90.0	99.0	26.8	93.8	94.7	Pass
209	"	188	F.G.	"	"	27.1	92.8	93.7	"
210	"	191	F.G.	"	"	24.5	94.0	94.9	"
211	"	204	24.0	"	"	26.2	94.1	95.1	"
212	"	194	F.G.	"	"	25.1	93.6	94.5	"
213	"	198	F.G.	"	"	27.1	92.8	93.7	"
214	"	204	25.0	"	"	27.3	91.2	92.1	"
215	8-6	204	26.0	"	"	28.3	92.4	93.3	"
216	"	292	F.G.	"	"	27.6	92.0	92.9	"
217	"	295	F.G.	"	"	27.2	91.6	92.5	"
218	"	299	F.G.	"	"	28.6	91.2	92.1	"
219	"	186	F.G.	"	"	29.0	91.0	91.9	"
220	"	177	F.G.	"	"	27.9	92.7	93.6	"
221	"	175	48.0	"	"	26.7	91.9	92.8	"
222	8-7	204	27.0	"	"	25.3	92.2	93.1	"
223	"	162	F.G.	"	"	23.8	93.9	94.8	"
224	"	169	48.0	"	"	24.0	93.5	94.4	"
225	"	169	F.G.	"	"	27.6	92.9	93.8	"
226	"	175	F.G.	"	"	25.0	95.2	96.2	"
227	"	303	F.G.	"	"	25.9	92.2	93.1	"
228	"	307	F.G.	"	"	26.0	92.5	93.4	"
229	8-8	204	28.0	"	"	27.7	90.0	91.8	"
230	"	207	22.0	"	"	24.7	94.1	95.1	"

SUMMARY OF DENSITY TESTS
CONTROL OF COMPACTED FILL

W.O. NO. 773-20
PAGE 11 OF 12

OWNER Oceanic Properties
JOB Paalaa Kai Units I & II

TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
231	8-8	Lot 212	21.0	90.0	99.0	26.5	91.9	92.8	Pass
232	"	215	24.0	"	"	25.1	94.6	95.6	"
233	"	215	25.0	"	"	25.7	93.3	94.2	"
234	"	133	34.0	"	"	23.1	94.1	95.1	"
235	"	254	F.G.	"	"	23.5	94.6	95.6	"
236	8-9	257	F.G.	"	"	26.2	92.1	93.0	"
237	"	261	F.G.	"	"	25.8	92.0	92.9	"
238	"	136	F.G.	"	"	25.4	93.4	94.3	"
239	"	121	30.0	"	"	26.0	94.0	94.9	"
240	"	215	26.0	"	"	25.6	93.1	94.0	"
241	8-10	121	F.G.	"	"	26.5	92.3	93.2	"
242	"	140	F.G.	"	"	27.9	91.8	92.7	"
243	"	146	F.G.	"	"	24.4	95.5	96.5	"
244	"	215	27.0	"	"	26.5	92.3	93.2	"
245	"	133	F.G.	"	"	23.8	95.2	96.2	"
246	8-13	106	F.G.	"	"	24.8	92.9	93.8	"
247	"	109	F.G.	"	"	23.4	95.1	96.1	"
248	"	113	F.G.	"	"	26.0	92.1	93.0	"
249	"	243	21.0	"	"	26.1	93.8	94.7	"
250	"	247	21.0	"	"	25.0	93.6	94.5	"
251	8-14	215	F.G.	"	"	26.5	92.4	93.3	"
252	"	243	F.G.	"	"	27.4	90.0	91.8	"
253	"	247	F.G.	"	"	25.7	93.9	94.8	"

SUMMARY OF DENSITY TESTS
CONTROL OF COMPACTED FILL

W.O. NO. 773-20
PAGE 12 OF 12

OWNER Oceanic Properties
JOB Paalaa Kai Units I & II

TEST NO.	DATE 1979	TEST LOCATION	ELEV. FT.	% COMP. REQ'D	MAX. DRY DENSITY P.C.F.	FILL MOISTURE %	TEST DRY DENSITY P.C.F.	% MAX. DRY DENSITY	REMARKS
254	8-14	Lot 207	23.0	90.0	99.0	26.4	92.7	93.6	Pass
255	9-7	204	30.0	"	99.2	25.5	92.5	93.2	"
256	"	207	26.0	"	"	26.8	92.4	93.1	"
257	"	212	24.0	"	"	26.2	93.3	94.1	"
258	9-11	204	31.0	"	"	25.5	92.4	93.1	"
259	"	207	27.0	"	"	27.0	91.9	92.6	"
260	"	212	27.0	"	"	26.5	91.9	92.6	"
261	9-12	207	28.0	"	"	26.9	92.1	92.8	"
262	"	207	29.0	"	"	28.5	91.8	92.5	"
263	9-13	204	F.G.	"	"	27.5	92.5	93.2	"
264	"	207	F.G.	"	"	26.6	94.2	95.0	"
265	12-5	Temporary stabilization pond	15.0	"	99.0	27.2	92.2	95.1	"
266	12-7	"	16.0	"	"	25.3	94.2	95.2	"
267	"	"	17.0	"	"	26.7	92.3	93.2	"
268	12-13	"	19.5	"	"	22.1	90.6	91.5	"
269	12-27	"	F.G.	"	"	27.4	90.3	91.2	"
270	"	"	F.G.	"	"	28.4	89.2	90.1	"

GEOLABS-HAWAII
Geology, Soils and Foundation Engineering
1553 Colburn Street, Suite 202 • Honolulu, Hawaii 96817 • (808) 841-5064

March 19, 1980

W.O. 773-20

Department of Housing and
Urban Development
300 Ala Moana Blvd.
P.O. Box 50007
Honolulu, Hawaii 96850

Attention: Mr. Ed Sakamoto

Subject: Settlement Gauge Readings &
Compaction Test Location Maps
Paalaa Kai Subdivision, Phases I & II
Waialua, Oahu, Hawaii

Reference: Our Interim Compaction Report
dated February 15, 1980

Gentlemen:

As requested, we are submitting the compaction test location maps for the above referenced project. The approximate locations of the compaction tests presented in our Interim Compaction Report dated February 15, 1980 are presented on these maps.

We are also transmitting the surveyed settlement gauge readings by M-E Pacific, Inc., project surveyor, for the three gauges installed in Phase II on Lot 205, Lot 211/212 and Lot 215 located near the peat bog area.

Prior to filling in this area, additional test borings drilled after site grubbing disclosed a stiff dessicated upper layer or "crust", about 7 feet thick, underlain by about 4 to 12 feet of soft to medium stiff soils. Based on the June 1979 borings and laboratory tests, a few inches of settlement were anticipated due to the weight of the proposed fill over the soft to medium soils. Settlements estimated from laboratory test results are not exact and that the actual magnitudes do vary from the calculated values. Therefore, settlement gauges were recommended in this area to monitor the anticipated settlements.

Based on the available surveyed settlement gauge readings, it appears that the stiff crust overlying the soft subsoils is helping to bridge over the soft subsoils and therefore, the resulting settlements are less than anticipated. Based on the results of the attached settlement gauge readings, it is our opinion that the fill settlement rates appear to be within the tolerable limits for the proposed post-and-beam wood-framed residential structures.

Should you have any questions concerning this letter, please feel free to contact us.

Respectfully submitted,

C.W. ASSOCIATES, INC.
dba GEOLABS-HAWAII

By Bob Y.K. Wong, P.E.

Enclosure: Settlement Gauge Readings
by M-E Pacific Inc.
Compaction Test Location Maps (5 Plates)

XC: Oceanic Properties Inc.
Attn: Mr. James G. Caldwell

SETTLEMENT GAGE READINGS

Paalaa kai Unit-2

Date of Gage Reading	8-21-79	9-22-79		11-5-79		12-12-79		2-5-80			
Gage No. / Change											
# 1 Lot 105	31.939	31.934	-0.005	31.932	-0.007	31.942	+0.003	OUT			
A	7.3	31.4		31.6		33.2					
# 2 Lots 111/112	32.910	32.627	New Gage	32.784	+0.157	32.757	+0.130	32.732	+0.105		
A	22.5	28.4		28.7		28.7		29.1			
# 3 Lot 115	30.245	30.249	+0.004	30.240	-0.009	30.245	0.000	OUT			
A	29.7	29.6		29.7		29.6					
GAGE # 1 New (TOP)						36.992		OUT			

LEGEND

* Indicates remaining height of gage.
Δ Indicates ground elevation at gage.
C Indicates elevation of new mark.
□ Indicates average top of sub-charge elevation.

GP 9117
1/21/81

Belt, Collins & Associates
A division of Lyon Associates, Incorporated
Engineers • Planners • Landscape Architects • Architects
5th Floor Hawaii Bldg. 745 Fort Street Honolulu, HI 96813 Telephone (808) 521-5361 Telex (723)8732

January 20, 1981
81AC-115

SR-47

Construction Section
Division of Engineering
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Mr. Mel Young

Subject: Paalaa Kai Subdivision, Units 1 and 2
Waialua, Oahu, Hawaii

Gentlemen:

Per your request we are transmitting the following items:

1. Grading Certification from M&E Pacific, Inc.

2. Interim Compaction Report, February 15, 1980, by Geolabs-Hawaii.

The above items are necessary to complete the requirements of the grading permits for the Paalaa Kai Subdivision.

Very truly yours,

Ed Miyashiro

Ed Miyashiro

EM:gk

Encls.

cc: Ken Toshi

M&E Pacific, Inc.

Environmental Engineers

Pacific Trade Center, Suite 600
190 South King Street
Honolulu, Hawaii 96813
(808) 521-3051 Telex: 7430065

January 15, 1981

Belt, Collins & Associates
Hawaii Bldg., Suite 514
745 Fort Street
Honolulu, Hawaii 96813

ATTENTION: Mr. Ed Miyashiro

SUBJECT: Grading Certification for the Paalaa Kai Subdivision
Units 1 and 2
Wailua, Oahu, Hawaii

As surveyors for this project, we hereby certify that our survey shows that the grading has been completed and that the elevations were found to be in conformance with those shown on the construction plans prepared by your office for the subject project.

Lorraine Maeda
Registered Land Surveyor
Certificate No. 4722

jn

cc: Mr. Kenneth Toshi, Mililani Town, Inc.
cc: TO DIV. OF ENGR, ATTN. MEL YOUNG